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7 January 1982

East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 1/82)

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CZECHOSLOVAKIA

ENERGY, FUEL CONSERVATION MEASURES RECOMMENDED

Recommendations of FMPE Engineers

Prague ENERGETIKA in Czech No 9, 1981 pp 410-415

[Article by Eng Marie Krbeckova and Eng Zdenek Zorkler, Federal Ministry of Fuels and Power, Prague: "Increasing the Efficiency of Fuel and Energy Use in the Seventh and Eighth Five-Year Plans"]

[Text] For us, as for all industrially developed countries of the world, solving the fuel and power problem has become a critical question for further development. The difficulty in obtaining fuels and energy both from domestic sources and through import, and especially the continuing rise in their prices on world markets, whose results cannot be avoided, compels us to concern ourselves very seriously with using the efficiently.

Our possibilities for further import of fuels and energy are limited, thus satisfaction of our economy's growing demands will require further expansion of domestic extraction, particularly of brown coal; but this must be accompanied by increased efficiency and strict conservation in the use of all fuel and energy resources available to our society. In particular, we must considerably speed up our improvement of the efficiency of fuel and energy use and establish strict conservation in their consumption in all sectors of our society.

One of the most important purchasers and consumers of solid and liquid fuels, both domestic and imported, is the power industry. Accordingly, the requirement of decreasing the energy intensiveness of electric power production and heat supply is in the forefront of our interest. In addition, the power industry faces the problem of using all available types of fuel, including low caloric value brown coal.

In accordance with the conclusions of the 14th and 15th CPCZ congresses and the special program adopted at the 32d CEMA session, the Ministry of Fuels and Power [FMPE] based its preparations for the Seventh Five-Year Plan on the premise of maximum use of domestic fuel and energy resources and on steady decreases in the energy intensiveness of the national economy.

One of the key programs on which the power industry will rely is the State Special Program for Increasing the Efficiency of Fuel and Energy Use, which is of critical importance to the fuel and energy balance.

Essentially, we must proceed on the assumption that increases in the fuels and energy during the Seventh Five-Year Plan will be made available only through conservation.

In Decree No 240/79, the CSSR Government Presidium approved the concept of the State Special Program for Increasing the Efficiency of Fuel and Energy Use developed by the Federal Ministry of Technical and Investment Development [FMTIR], specifying that the program should be developed in accordance with CSSR Government Decree No 103/79 regarding procedures for developing state special programs for the Seventh Five-Year Plan.

In accordance with the set of measures for achieving fuel and energy savings in the first years of the Seventh Five-Year Plan, the FMPE has developed, in cooperation with the Federal Ministry of Metallurgy and Heavy Engineering [FMHRS] and the Federal Ministry of General Engineering [MFVS], a set of technical and organizational measures aimed at decreasing specific fuel consumption in the production of electricity by condensation units in the 100-200 MW range by at least 8 grams of standard fuel [GMP] per kilowatt-hour in 1985 and by 12 GMP per kilowatt-hour in 1990 compared with the 1980 figure.

This set of technical and organizational measures contains the following steps:

--a program of modernizing the flow sections of 200-MW and 110-MW turbines, to be carried out on at least 10 200-MW units and 9 110-MW units by 1985 in accordance with the program of general overhaul of the units;

--assuring proper operation of condensers by introducing progressive methods of cleaning them, so as to achieve a decrease of at least 1 percent in specific fuel consumption for electric power production;

--a performance program for the commissioning and incorporation of new equipment for automating and optimizing combustion regulation, particularly using oxygen sensors and microprocessor devices, to result in a saving of at least 2 percent on specific fuel consumption;

--intensifying the operation of cooling towers and achieving the desired degree of cooling of water by modifications of the towers, to yield a drop of at least 0.5 percent in specific fuel consumption;

--development of a program for modification and reconstruction of other selected groups of electric power station equipment (other than that covered above) so as to improve the operating characteristics of 110-MW and 200-MW units and bring the specific fuel consumption into line with design figures;

--development of a set of measures to speed up the beginning of operation of the units in the Prunerov II power station in order to achieve the planned specific fuel consumption values not later than 6 years from the commissioning of the units.

In addition, modifications will be made on process equipment and a program for managing fuel deliveries and operation of coal equipment aimed at eliminating decreases in the caloric value of coal and the harm done by changes in fuel qualities and discrepancies with the planned values must be developed.

Based on the degree of understanding of technical approaches and on supplier performance to date, the program of efficiency-improvement measures for 100-MW and 200-MW units may be carried out in the areas mentioned.

Improvements on Flow Sections of Turbines

As a result of operation under condensation conditions which depart from design specification, 100-MW, 110-MW and 200-MW turbines are showing worsening specific fuel consumption figures.

Reconstruction of the flow sections of 110-MW turbines in accordance with the proposal of Skoda Concern in Plzen is planned. The proposal has now been made more specific, specifying two variants for modification of the flow sections of 200-MW turbines and three variants for the 110-MW turbines.

In the 200-MW units, it is proposed to replace four diaphragms in the low-pressure section and to shorten the last set of buckets (variant I) or to replace four diaphragms and replace the last set of buckets.

In the 110-MW units, all of the improvements will be made on the final stages of the low-pressure sections of the turbines.

The following types of improvements are involved:

--overhaul of the low-pressure sections, leading to a decrease in specific fuel consumption without the possibility of withdrawal of heat;

--modification of the low-pressure sections, leading to a decrease in specific fuel consumption and allowing unregulated withdrawal of up to 334 GJ/hr [gigajoules per hour] of heat for heat supply;

--modification of the low-pressure sections, resulting in a decrease in specific fuel consumption and allowing regulated withdrawal of up to 585-627 GJ/hr of heat between the medium-pressure and low-pressure sections for heat-supply purposes.

It will be possible at the same time to replace wornout interior castings with welded steel components.

For withdrawal of higher-pressure steam, it is proposed to add an outlet after the ninth stage of the medium-pressure section of the turbines, with a throat diameter of up to 800 mm.

The FMPE requires that the modifications on the 100-200 MW turbines be done by 1983 and that overhaul of 9 110-MW units and 10 200-MW units be carried out during the Seventh Five-Year Plan. During the Eighth Five-Year Plan, the ministry proposes to carry out improvements on 15 100-110 MW turbines and 9 200-MW turbines.

The improvements on the flow sections of the turbines will be carried out as part of planned, standard general overhaul, i.e., with an average of 10-14 weeks' stoppage.

Since the contractor has not yet determined the expenditures required or calculated the resulting decrease in fuel consumption, the FMPR has used rough technical estimates to arrive at these figures:

--expenditures of about Kcs 15 million for the 200-MW units and a decrease of 0.6 percent in specific fuel consumption (for each unit);

--a cost of about Kcs 10 million for the 100-MW units and a decrease of 1 percent in specific fuel consumption (for each unit).

On this basis, we may estimate that the overall effect of improving the flow sections of 100-200 MW turbines during the seventh and eighth five-year plans will result in a saving of about 110,000 tons of standard fuel [time] in 1990 compared with 1980. The improvements made during the Seventh Five-Year Plan will yield a saving of about 35,000 TMP in 1985. Overall expenditures on improvement of the flow sections of the turbines proposed for the seventh and eighth five-year plans are preliminarily estimated at half a billion korunas.

Continuous Cleaning of Condensers

At present, the imported continuous condenser cleaning system has been installed on three 200-MW units in the Chvaletice power station and on one 200-MW unit in the Pocerady I station. Experience and operating results have been favorable, and in particular the Chvaletice station has continuously maintained the condensers in their planned operating conditions. Compared with the previous state of affairs (involving periodic cleaning of condensers with the units stopped), there has been improvement in specific fuel consumption, with the overall effect currently in the vicinity of 2 percent.

This type of condenser cleaning in the 200-MW units in the Jslovske Bohunice nuclear power station, all of whost units had been equipped with this system by the end of the year, has received a particularly positive evaluation.

The equipping of almost all 100-200 MW blocks with continuous condenser cleaning during the Seventh Five-Year Plan is being considered. The Polish contractor for the Prunerov II station which is under construction is considering a different condenser system. During the Seventh Five-Year Plan it is proposed to install the devices on a total of 15 200-MW units, which is expected to yield an annual saving of about 120,000 TMP in 1985 as compared with 1980, and to install them on 33 100-MW and 110-MW units, which is expected to yield an annual saving of about 130,000 TMP in 1985 compared with 1980.

Because of the quality of the cooling water in the Novaky II and Vojany I power stations, installation of continuous condenser cleaning and realization of the desired effect depend on additional investment in pressure filters to remove coarse mechanical impurities from the water.

The total effect from the introduction of continuous condenser cleaning and pressure filter during the Seventh Five-Year Plan will be an annual saving of about 250,000 TMP in the last year, 1985, as compared with 1980.

Because of the considerable benefit to be realized from tube cleaning and filtration of the cooling water, it is unquestionably economically expedient to have this equipment produced in Czechoslovakia within the FMHTS, and to cooperate with the rubber industry in seeing that rubber pellets are produced or imported. The benefits and economic effect from production of our own continuous condenser cleaning equipment will be particularly increased through their use in the nuclear program.

Moreover, it is proposed to introduce this equipment in units with smaller individual capacities, in addition to which our foreign trade sector is interested in including this equipment as part of the capital items which it already exports. Our machine building and chemical industries will have to see that the continuous condenser cleaning equipment is produced and complete sets made available as soon as possible so that the equipment can be made available to the power industry during the Seventh Five-Year Plan.

Combustion Management and Increased Efficiency: Oxygen Sensors

Optimization of the combustion process in the boilers of electric power stations depends on continuous monitoring, which is the basic precondition for automatic regulation.

The low technical standards of the flue gas analyzers currently in used to monitor the combustion process result from their constant shortcomings, such as considerable down time, time-consuming maintenance, and unreliable operation. These shortcomings, together with the considerable time delay in transmission of measurements, limits their potential for use as sensors for automatic combustion control in power station boilers.

Currently it is not realistic to keep combustion regulation in constant operation on any coal-fired unit. The main reason is the design of oxygen sensors for regulating combustion which have been imported by the VHJ ZAVT [Data-Processing Equipment Research and Development Base] as part of a cooperative agreement with East Germany.

The current unsatisfactory oxygen sensors could be replaced, for example, by equipment from Westinghouse, which uses the principle of an electric cell in a solid electrolyte in the form of a ceramic insert which is located in the flow gas itself, thus making it unnecessary to withdraw flue-gas samples through a gas duct. The product manufactures domestically, under Dr Kohler's patent, by Elektroporcelan Louny, has not yet had automation equipment developed for it.

The Westinghouse sensor has been tested on boiler No K22 in the Tusemice II power plant, and according to specialists from CEZ [Czechoslovak Power Plants] Concern and ORGREZ [Organization for Improvement of Electric Power Plant Efficiency] it has given an excellent account of itself.

It is expected that priority installation of oxygen sensors on 12 200-MW units during the Seventh Five-Year Plan would yield an annual saving of about 30,000 TMP in 1985 compared with 1980.

The FMPE proposes equipping the other 200-MW and 100-110 MW units with oxygen sensors during the Eighth Five-Year Plan and expects an annual saving of about 50,000 TMP. Overall, it is planned to equip boiler units with 52 oxygen probes during the seventh and eight five-year plans; the annual saving is expected to be about 80,000 TMP in 1990 and compared with 1980.

Currently, East Germany has finished the development and has begun producing a pilot series of URSALYT RG flue-gas analyzers using a ceramic sensor, electronics and accessories with similar characteristics to those of the Westinghouse sensor described above. In early 1981, as part of specialization arrangements, the first model of the East German sensor will be tested at ZPA DP [Machinery and Automation Plants] in Czechoslovakia. Depending on the test results, the product will be included in specialization agreements, with deliveries expected to begin by 1983, and possibly as early as 1982.

Modification of Cooling Towers To Increase Cooling Efficiency

Owing to an overestimate of heat transfer in the drip sections and failure to achieve the required air draft, the colling efficiency of natural-draft cooling towers in the Detmarovice, Chvaletice, Novaky B (units 3 and 4) and Vojany II power stations has been considerably lessened.

The corrective measures involve an increase in the heat exchange surface, improvement of the water distribution function, and a more uniform flow of cooling air.

After the changeover to AVIA blowers, an inadequate air throughput was found in blower-type cooling tower No 905; the blowers were modified using bypass edges. Although these improvements made it possible to achieve the design capacities, some shortcomings in equipment reliability remain.

As part of the state assignment for development of science and technology (VHJ Prumyslove stavby [Industrial Construction] Brno, designer and performer, with cooperation of CSVZ [? Czechoslovak Air Engineering Plants]), the new APX 8000 blower has been developed and is gradually replacing the existing temporary arrangement.

The FMPE proposes carrying out reconstruction and modernization of seven cooling towers (one at Detmarovice, four at Chvaletice, two at Novaky B) during the Seventh Five-Year Plan in order to increase the cooling efficiency, with an expected annual saving of 13,000 TMP in 1985 compared with 1980.

For the Eighth Five-Year Plan, modification, reconstruction and construction of a total of 21 cooling towers is being discussed, but their planned annual saving of about 30,000 TMP is not yet commensurate with the expected cost of the work: the plan will be further refined, and a decision will be made with reference to additional circumstances such as achievement of full output by the units and the like.

Stabilizing Operation of the Prunerov II Power Station

To speed up the startup of the five 210-MW units in the Prunerov II power station so as to achieve the planned specific fuel consumption values within 6 years of

the commissioning of each unit, pursuant to a contract between Skodaexport foreign trade enterprise and the Budimex-Elektrim Consortium of Polish Central Foreign Trade Organizations regarding the construction of Prunerov II, KPS [expansion unknown] in Poland and EGI [expansion unknown] have developed a "Program of Guarantee Tests" and requirements for guarantee measurements, including an indication of fuel consumption achieved.

Depending on the results of these tests, a further program for speeding up the full operation of the units and achievement of the planned operating parameters may be developed.

Achievement of the design parameters within 6 years of commissioning would yield a saving of about 150,000 TMP in 1985 compared with 1980. For the Eighth Five-Year Plan, an additional annual saving of about 66,000 TMP in 1990 compared with the expected 1985 values is being discussed.

Other Efficiency-Improvement Measures Aimed at Improving the Operation of 100-200 MW Units

These involve primarily increased efficiency of turbine and boiler operation, implementation of Soviet experts' suggestions for new-generation 200-MW units, improvement of the operation of heat regeneration systems, and other modeifications to mitigate the negative effect of worsening fuel quality.

The programs in question involve the following main subject areas:

a. Modifying combustion regimes

--reconstruction of powder burners,
--improved control of secondary combustion air flow,
--recirculation of cool combustion gases,
--more efficient management of combustion regimes,
--cleaning the pressure pump air heaters (WOMA),
--reconstruction of flue-gas blowers,
--reconstruction of boiler accessories, dryers, milling units and classifiers,
--thyristor control of stocker speed;

b. Modification of turbines and equipment

--reconstruction and replacement of high-pressure heaters,
--installation of subcoolers with high-pressure heaters,
--modification of heaters,
--replacement of feed pump bypass valves,
--increasing the temperature of MP [expansion unknown] steam by 15°C,
--reconstruction of injectors,
--reconstruction of vacuum system,
--increasing the tightness of valves;

c. Other

--homogenization of fuel dumps,
--optimization of cooling water treatment,
--stabilization of operation, with decreased number of startups.

If all of these projects were carried out, FMPE estimates that the annual saving in 1990 compared with 1980 would total 440,000 TMP.

Overall Effect of Efficiency Improvement-Measures

The proposed measures for decreasing specific fuel consumption for 100-200 MW units represent the summation of all currently-known technical measures and expert estimates and their contributions to decreasing specific fuel consumption.

Following evaluation of all available data, the total effect of the set of proposed measures was calculated; it amounted to about 613,000 TMP in 1985 compared with 1980, and 830,000 TMP in 1990 compared with 1980.

Long-term monitoring of trends in the quality levels of fuel indicates that the quality of coal, particularly brown coal, has been steadily decreasing. Since 1972 the average annual drop in caloric content has been 0.75 percent.

The discrepancy between the quality ratings of coal supplied and the design values for which the facilities were built is producing important negative consequences as regards downtime, reliability and production economy.

**To eliminate or mitigate the resulting harm, CEZ and SEP [expansion unknown], **together with SES [expansion unknown] Tlmace and VUZES [expansion unknown] Brno have worked out modifications for production equipment, especially boilers.

After allowance for the negative effects of fuel anticipated for the Eighth Five-Year Plan, the assignment for annual conservation of 620,000 TMP in 1990 is fulfilled at the level of 530,000 RMP. Table 1 shows the expected trend of specific fuel consumption in 100-200 MW units.

Table 1. Estimated trend of specific fuel consumption in 100-200 MW units in the Seventh and Eigth Five-Year Plans if proposed efficiency improvement measures are implemented.

Tab. 1. Očekávaný vývoj měrné spotřeby paliva na 100 až 200 MW blocích v 7. a 8. SLP při realizaci navrhovaných racionalizačních opatření

	a	Skutečnost roku 1980 b		7. 5LP d			8. 5LP e		
	Výroba elektrické energie*)	c Měrná spotřeba paliva	f Racionalizační opatření Započitatelný efekt	g Vliv paliva	h Měrná spotřeba paliva vypočtená — 1985		f Racionalizační opatření Započitatelný efekt	g Vliv paliva	h Měrná spotřeba paliva vypočtená — 1990
	GWh	GJ MWh	tis. GJ	tis. GJ	GJ MWh		tis. GJ	tis. GJ	GJ MWh
i 200 MW bloky									
Počerady I	3 400	10,8014	798,6	1 216,4	10,9259		496,7		
Počerady II	2 500	10,9571	810,8	495,9	10,7969		162,4		
Ledvice I	1 160	10,7957	471,8	349,0	10,6885		133,1		
Tušimice II	1 482	11,2499	1 527,5	285,3	10,9728		200,7		
Chvaletice	5 000	11,3267	1 431,9	1 186,3	11,2776		986,1		
Dětmarovice	4 428	11,2484	2 071,3	375,4	10,8646		532,8		
Prunéřov II	5 376	12,3090	4 302,4	—	10,5091		1 859,2		
j 100-110 MW bloky									
Tisová II	1 700	11,6761	419,6	290,1	11,5453		347,6		
Tušimice I	3 555	11,3143	868,5	205,2	11,1281		968,5		
Prunéřov I	2 780	11,9180	897,3	296,3	11,6996		668,5		
Ledvice II	1 680	10,7120	440,8	597,1	10,8585		576,5		
Mělník II	2 000	12,0571	467,8	234,5	11,9399		252,8		
Nováky B	2 090	12,4706	443,2	527,5	11,5150		834,3		
Vojany I	3 180	11,6361	572,7	—	11,4564		852,6		
Vojany II	2 200	11,1944	—	—	11,1955		—		
k Celkem 100 až 200 MW bloky	45 241	11,4329	15 527,2	5 969,4	11,2219		8 781,8	2 930,9	11,0929

*) očekávaná výroba elektrické energie v koncových letech 1985 a 1990

Key:

a. Electrical energy output*
b. Actual, 1980
c. Specific fuel consumption
d. Seventh Five-Year Plan
e. Eighth Five-Year Plan
f. Expected effect of efficiency-improvement measures, thousand GJ
g. Contribution by fuel, thousand GJ
h. Expected specific fuel consumption, GJ/kWh
i. 200-MW units
j. 100-110 MW units
k. Total for 100-200 MW units

*Expected output of electrical energy in concluding years, 1985 and 1990.

Estimates of the Contribution To Be Made by the Program of Efficiency-Improvement Measures

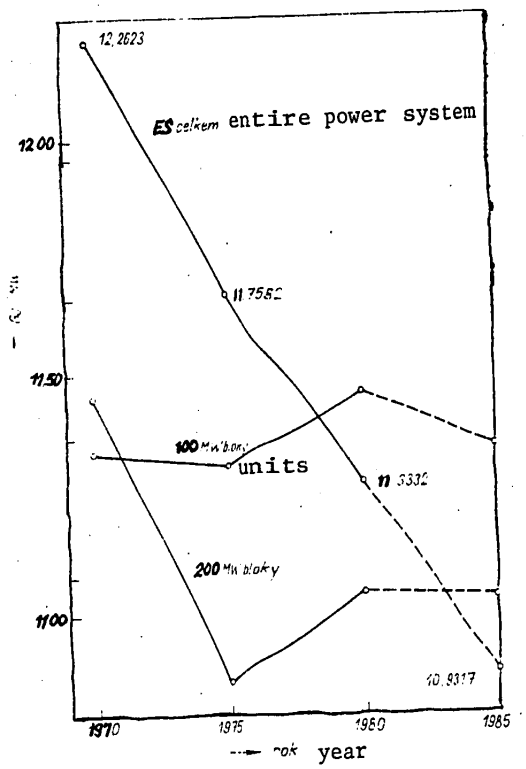
To assure implementation of the proposed efficiency-improvement measures in the Seventh Five-Year Plan, it will be necessary to provide for expenditures amounting to almost Kcs 1 billion, including 135 million foreign-exchange korunas.

imports from capitalist countries are proposed only for the Seventh Five-Year Plan, for equipment which is not yet produced in this country or other socialist countries and which is not expected to be procurable in other ways. No imports from capitalist countries are contemplated for the Eigth Five-Year Plan, because we expect that the necessary equipment will be provided by domestic sources as a result of the necessary organizational measures in the FMHTS, FMVS, FMEP, and the CSR and SSR ministers of industry, or by import from socialist countries.

The set of efficiency-improvement measures creates the conditions for accomplishing the task of decreasing specific fuel consumption for electric power production in 100-200 MW units by 8 GMP per kWh in 1985 and by 12 GMP per kWh in 1990 as compared with 1980. The measures described will result in a drop of 7.2 GMP per kWh in 1985 and 11.2 GMP per kWh in 1990. In accordance with the program of technical and organizational measures for 100-200 MW power station units in the seventh and eighth five-year plans, and in connection with the program of measures for lower power units, a model for optimizing the use of all power station capacities has been worked out with the aim of making use of available fuel and decreasing specific fuel consumption in electric power production of 373 GMP per kWh by 1985, equivalent to 10.9317 GJ/MWh as specified in the guidelines for the Seventh Five-Year Plan.

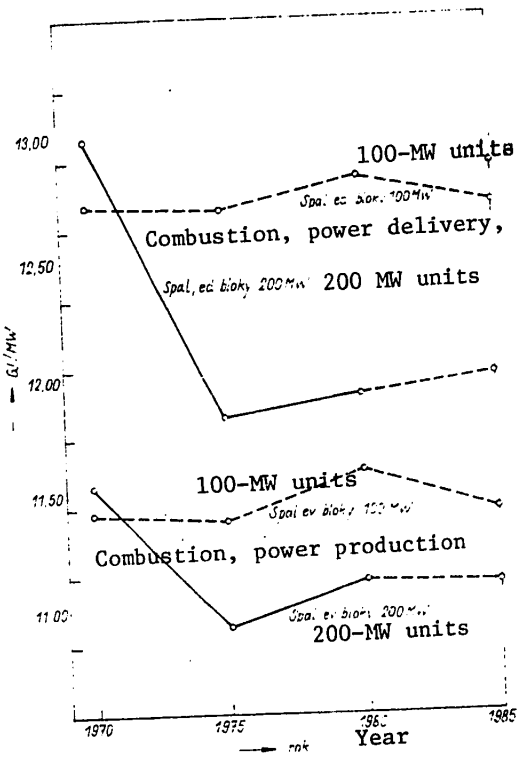
The trend of specific fuel consumption in 109-200 MW units in 1970-1980 and the expected development through 1985 are shown in Figs 1 and 2 and Table 2.

Fig 1. Specific fuel consumption for electric power production in 1970-1980, and expected development in the Seventh Five-Year plan, 1981-1985



Obr. 1. Vývoj měrné spotřeby paliva na výrobu elektrické energie v letech 1970—1980 a předpokládaný vývoj v 7. pětiletce 1981 až 1985

Fig 2. Specific fuel consumption for electric power production and delivery by 100-MW and -200 MW units in 1970-1980, and expected development in the Seventh Five-Year Plan.



Obr. 2. Vývoj měrné spotřeby paliva u 100 a 200 MW bloků na výrobu a dodávku elektrické energie v letech 1970—1980 a očekávaný vývoj v 7. pětiletce

Table 2. Specific fuel consumption in 100-200 MW units in 1970-1985.

Key:

a. Specific fuel consumption for electric power production
b. Specific fuel consumption for electric power delivery
c. Base index
d. 200-MW units
e. 100-MW units
f. CSSR electric power system

Notes: 1. The 1985 plan is based on implementation of the program of proposed efficiency-improvement measures for 100-200 MW units.
2. The 1985 plan is based on the directive of the draft Seventh Five-Year Plan.

Tab. 2. Vývoj měrné spotřeby paliva u bloků 100 až 200 MW v letech 1970—1985

	Měrná spotřeba a paliva na výrobu elektrické energie		Měrná spotřeba b paliva na dodávku elektrické energie	
	[GJ/MWh]	bázický index c	[GJ/MWh]	bázický index c
200 MW bloky d				
1970	11,5150	×	12,9756	×
1975	10,9142	0,948	11,8112	0,910
1980	11,1046	0,964	11,8801	0,916
1985 — plán[1])	11,0871	0,963	11,9731	0,923
100 MW bloky e				
1970	11,3977	×	12,7036	×
1975	11,3713	0,998	12,6439	0,995
1980	11,5208	1,011	12,8148	1,009
1985 — plán[1])	11,4065	1,001	12,6843	0,998
ES — ČSSR f				
1970	12,2623	×	13,5308	×
1975	11,7582	0,959	12,9242	0,955
1980	11,3332	0,294	12,3597	0,914
1985 — plán[2])	10,9317	0,891	12,0249	0,889

Poznámka: [1]) — plán 1985 vyplývá z realizace programu navržených racionalizačních akcí 100 až 200 MW bloků.
[2]) — plán 1985 vyplývá ze směrnice návrhu 7. 5LP.

The proposed efficiency-improvement measures were discussed at the end of 1980 by the CSSR Government Presidium; the FMPE, in cooperation with other interested ministries, is carrying out the proposed program.

The power industry is fully responsible for the implementation of the program for increasing efficiency of fuel use in electric power production which has been adopted. Accordingly, concrete, specifically targeted assignments which embody the efficiency-improvement measures imposed on the power industry by CSSR Government Decrees Nos 240/79 and 290/81 are an inseparable part of the work program of all power industry organizations which will create the conditions for fulfillment of the tasks of the Seventh Five-Year Plan.

Even today, however, we must be aware that without close cooperation between the power industry and all affected departments, it is impossible to accomplish the task completely. But considerably increasing the efficiency of fuel and energy use is a task which must be accomplished throughout the national economy.

It is literally today's task. Accordingly, we call for the cooperation of all who are responsible for partial assignments in the program of efficiency-improvement measures aimed at decreasing specific fuel consumption in electric power production by 100-200 MW units, and especially the cooperation of those who will be directly responsible for the assignment in the area of supplier-purchaser relations and will be making deliveries to the power industry.

The proposed set of efficiency-improvement measures is still open: it will be necessary to return to it constantly and refine it as new scientific and technical findings make it possible to solve the problems in question in even better and more progressive ways.

Accordingly, in addition to being a summons to the ministries involved to take part, our call must also be understood as a summons to all workers and technicians in power-production facilities to cooperate, to take an active part in the accomplishment of this efficiency improvement program, and thus to help with the complete fulfillment of the proposed measures.

By their attitude, power industry personnel give great help in showing the way to solve the problems of improving the efficiency of fuel use. We want them to be in the forefront on this road, but not by themselves, for the equalizing of both today's and tomorrow's fuel and energy balance is a matter for us all.

Contest Entries

Prague ENERGETIKA in Czech No 9, 1981 p 415

[Article: "Selected Entries in the Nationwide Contest 'For Efficient Utilization of Fuel and Energy'"]

[Text] Stoppages of 200-MW Power Station Units with Sliding Parameters--Brief Technical Description

The essence of this entry is the introduction of shutdowns of power station units, i.e., boilers, turbines and other equipment, on the basis of so-called "sliding

parameters." The principle is progressive, preplanned lowering of steam temperature and pressure. This will lead to faster cooling of steam piping to the turbine and of the steam turbine itself; the result will be a shortening of the time required for free cooling after which it is possible to begin disassembly and repair work, especially when maintenance work in the turbine is involved. This method is advantageous when work requiring cooling down of this equipment must be performed in a power-production unit.

Since such work frequently limits the total amount of time during which the unit is out of operation, the method will lead to a shortening of stoppages for repair and maintenance, which will increase the available power in the electrical system. When a 200-MW unit is shut down, the lost electric power must always be compensated by other power stations which operate less economically. Thus implementation of this proposal will yield a considerable saving of fuel. There will be other savings in operating expenditures as a result of shorter stoppages.

During the competition period, this measure has already resulted in a demonstrable saving of 8,734 tons of standard fuel [TMP].

More detailed information is available from Eng Jiri Marek, CSE [Czechoslovak Energetics], Skoda o.p., 300 00 Plzen.

Utilization of Petroleum Fractions and Subsurface Water During Hydraulic Protection of Subsurface Water--Brief Technical Description

Leakages of raw materials, intermediates and finished products from the Slovnaft [Slovak Petroleum] national enterprise have polluted the subsurface waters in Bratislava (in the area of Zitny Island).

Among the alternatives for dealing with the situation, priority was given to the active aspects of total elimination of the pollution. The solution consists of development and implementation of a system for protection of the subsurface waters by means of wells, making it possible to trop the pollutants.

When subsurface waters are pumped from the system of wells, waste oil fractions are obtained. These are separated and refined in the enterprise's refining facility. Cold water is used for process cleaning and other purposes, primarily in the barometric condenser for atmospheric-vacuum distillation of petroleum, making possible a higher vacuum.

This method will yield the following savings:

--a benefit from the use of refined waste petroleum fractions;
--the possibility of ceasing the pumping of surface water from the Danube;
--a decrease in total process water consumption at the AVD VI [atmospheric-vacuum distillation facility];
--the increased vacuum will decrease the consumption of heating oil in atmospheric-vacuum distillation of petroleum in the AVD VI.

Actual savings during the competition period have amounted to 11,159 TMP, 110 kW of electric power, Kcs 9.36 million and additional savings of Kcs 540,000.

More detailed information is available from Eng Mikulas Juscik, Slovnaft national enterprise, 800 00 Bratislava.

Introduction of Termovit Refractory Fiber in Production--Brief Technical Description

Following successful accomplishment of state research task C-55-322/006 for Rezistex, the production of a new refractory fiber insulating material, Termovit, was begun. The Eng Marcola's group developed the preparatory, planning and production documentation, while Eng Prostejovsky's group built the line for producing Termovit fiber at the Vitkovice enterprise, Plant 1, facility 110.

Before this product was introduced for insulation of metallurgical units, Czechoslovakia was dependent on import of refractory cermaics. The production of the fiber was prepared for in a short time, with maximum utilization of existing equipment from the Vistemat line in the production and auxiliary equipment area.

The application of Termovit refractory fiber and products made from it will result in:

--saving of fuel and energy,
--conservation of steel used for furnace construction,
--saving of conventional types of metallurgical refractory material,
--creation of the conditions for comprehensive automation of furnaces.

The overall social importance consists of:

--pioneering development and introduction of a new industrial sector in Czechoslovakia,
--creation of the conditions for ending dependency on import of refractory ceramic fibers using foreign exchange,
--creation of the conditions for modernizing furnaces in metallurgy, glass production, power production, materials heating and the like.

During the competition period, this measure has led to demonstrable savings of 15,000 tons of standard fuel, assumed savings of 3,000 tons of standard fuel, and savings of Kcs 3 million of foreign exchange.

More detailed information is available from Eng Pavel Prostejovsky, Vitkovice, o.p. 703 00 Ostrava.

Limiting Energy Losses in Distribution Piping by Eliminating Leakage During Operation--Brief Technical Description

In manifolds for steam, makeup water, synthetic gas, natural gas and other substances, leaks generally continue until the next possible stoppage of the production line, unit or entire production facility.

Use of the new Furmanite technology makes it possible to eliminate leakage from distribution piping during operation. An invaluable benefit is use of this method in the case of leakage emergencies at high pressures and temperatures.

This method of eliminating losses can be applied in heavy chemistry, petrochemistry and power-production enterprises. The design collective has created the conditions for more extensive utilization of this new sealing method, and it has been effectively put into use in a number of other enterprises.

The resulting savings during the competition period has amounted to 19,841 TMP, worth Kcs 6,150,710.

More detailed information is available from Stefan Senkar, Duslo national enterprise, 927 00 Sala.

Modernization of Steel Furnaces--Brief Technical Description

Steel production in earlier MB furnaces Nos 2 and 3 consumed large amounts of energy because this type of steel furnace has to be heated by imported low-sulfur heating oil and by coking gas. In addition, even when these units operated in a good heat regime and were worked at full intensity, the percentage of usable heat remained relatively low.

The essence of the measures described was replacement of the previous method of producing steel in two MB furnaces with capacities of 47 tons per hour each by a tandem process in one P furnace with a capacity of 170 tons per hour. The expediency of this solution consists, among other things, in the fact that expanded use of the already mastered new oxygen process for steel production in hearth furnaces at NHKG [Klement Gottwald New Metallurgical Works] makes it possible to save energy, and especially fuel.

During the competition period, the measure described has led to a saving of 15,000 TMP and further savings of 15,000 TMP are expected.

More detailed information is available from Eng Frantisek Sotola, NHKG n.p., 700 00 Ostrava.

Modernization of Equipment for Air Separation for Central Oxygen Shop in Ostrava--Brief Technical Description

The essence of this solution is the design modification of certain parts of separator unit No 35, resulting in greater heat transfer and increased rectification efficiency, and leading to a decrease in the required intake air pressure. Specifically, this involved modification of the main condenser and regenerator. For this technology, a new automatic computer control system was developed, making it possible to optimize oxygen production and thus decrease specific energy consumption, and to eliminate the danger of icing of the regenerators by excellent stabilization of their operation.

Demonstrable savings during the competition period have amounted to 1,804 TMP, 1,120 kW, and Kcs 1,454,000 while expected savings amount to 5,415 TMP.

More detailed information is available from Eng Jiri Sykora, CSc, FEROX n.p., 405 00 Decin.

Decreasing the Energy Intensiveness of an Opencut Operation--Brief Technical Description

For a number of years, the Uranove doly [Uranium Mines] concern in Pribram has experienced difficulty with a decreasing power factor in the drawing of electric power from 110/22 kV switchgear. The usual design for compensating reactive energy requires considerable investment expenditures and a long waiting period for equipment delivery.

A collective of power engineers made use of the findings of certain Czechoslovak and Hungarian experts and proposed decreasing the voltage in the feed network to the nominal figure, which decreased the power factor of the electrical energy drawn for operation of the mine without installation of compensating equipment.

Measurements by SEI [State Power Inspectorate] Prague have confirmed the correctness of the approach taken. It was confirmed that when the voltage was decreased by 1 percent on the switchgear buses from which most of the electricity was drawn for the uranium mine, there was a decrease of 10.6 percent in reactive power withdrawn and a decrease of 0.4 percent in the active electric power. The increased active component of current results from the considerable decrease in the reactive component. In this instance, of industrial consumption of electrical evergy, a decrease in the high transformer voltage to the rate value led to an improvement in the power factor of electricity drawn from the 110-kV line to the switchgear, while the decrease in the voltage in the high-voltage circuit did not result in a proportionate increase in current.

The saving resulting from this efficiency-improvement proposal was drawn from the finding described above. Demonstrable savings of electrical energy compared with the initial situation have amounted to 4,050 TMP a year, and 1,388 kW of electric power. There is now no need to install the proposed compensation equipment, which would have cost Kcs 2,125,000.

More detailed information is available from Eng Frantisek Hrudka, Uranove doly, k.p., 261 oo Pribram.

Use of Leftover Fraction from Butadiene Extraction--Brief Technical Description

The national enterprise Slovnaft in Bratislava supplies the national enterprise Kauchuk [Rubber] Kralupy with BB fractions, from which the latter obtains butadiene. The leftover fraction, for which there was no market, was burned in field burners. The competition measure consists of the fact that part of the fraction is sent back to Slovnaft, which has developed a process for using it in a mixture with propane; its process produces a propane-butane mixture.

The saving during the competition period has amounted to 5,130 TMP and Kcs 2,434,000.

More detailed information is available from Eng Ludovit Brezula, N.p. Slovnaft, 800 00 Bratislava.

Decreasing the Switchgear Voltage at ZANP, Mlada Boleslav--Brief Technical Description

The essence of this competition entry consists of replacing V22 undervoltage protection devices by type VUZ Devices on 6-kV synchronous electric motors which drive turbocompressors for the production of compressed air at AZNP [Automobile Works National Enterprise] in Mlada Boleslav.

To prevent compressor stoppages as a result of undervoltage, the voltage was previously maintained in the upper part of the permitted range, at about 22.9 kV. The installation of the new VZ2 [as published] undervoltage protection equipment, which is time-dependent, made it possible to increase the operating safety of the turbocompressors, allowing the operating voltage in the power system to be powered to 22 kV.

More detailed information is available from Jaromir Hrobnik, AZNP n.p., 293 01, Mlada Boleslave.

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CZECHOSLOVAKIA

MINISTER URGES MORE EFFICIENT USE OF CHEMICALS IN AGRICULTURE

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[Article by Eng Miroslav Toman, ScC, minister of agriculture and nutrition of the CSR in Prague: "Intensification of Agricultural Production with the Development and More Efficient Chemicalization in the Seventh Five-Year Plan"]

[Text] The standard volume and quality of food consumption clearly indicate the level of the economic development in individual countries. In the process of its building of a developed socialist society, the Czechoslovak Socialist Republic has distinctly increased its food consumption and by its current standard ranks among the foremost countries in the world. Like countries with the most advanced economy in the world, its consumption of foods of animal original has also increased dramatically.

Agriculture represents the leading and most vital branch in food production. This branch which had been developing over centuries in relative independence from development in other branches of the national economy is becoming more and more an organic, integral part of our entire economy. Other branches of the national economy are participating to an increasingly greater extent in agricultural production and the volume and quality of their deliveries of means and needs of production are growing. Sciences and technology as well as an intensive development of the means of production implemented in step with the economic progress of our entire national economy are intrinsically changing the character of agricultural production and development.

According to the program safeguarding the living standard of our population as stipulated by the 16th CPCZ Congress, the main task of our agriculture at present is to supply food and raw materials for its production in order to maintain the already achieved high level of consumption, to continue upgrading its quality and to achieve self-sufficiency. This most demanding and crucial task must be fulfilled not only in our agriculture and food production proper but also in branches supplying the means of production and in the service sector, especially in all fields of sciences and research dealing with agricultural production and providing material prerequisites for an efficient growth of its intensity and for higher social productivity of labor.

We have at present 0.45 hectares of agricultural and 0.32 hectares of arable lands per citizen. In every one of the recent five-year plans the acreage per citizen

was reduced by 3 to 4 percent. This loss must be restricted and stopped by all means available. Uncultivated, barren lands and old, obsolete building lots must be used for new construction projects and land must be returned to food production and recultivated at any cost.

The acreage per citizen of agricultural lands in our republic is limited and the only solution to the program for higher agricultural production is stimulation of its intensity by more thorough exploitation of all agricultural lands while observing the principles of environmental protection in individual areas, particularly by continuously improving the quality and productivity of all means of production and labor of agricultural workers in every capacity. Scientific-technological development focused on higher productivity and efficiency of means of production plays an extraordinarily important role in achieving more abundant agricultural production. More productive and efficient means of production (biological, chemical, technical and other) help substitute qualitative standards for a higher volume of social labor inputs.

The scope and complexity of the tasks aimed at more efficient agriculture, characterized in the present stage by the growth and consolidation of centralized and intensified specialization based on cooperation between enterprises, by agricultural and industrial integration and by industrialization of agricultural production, make increasingly higher demands on sciences, particularly on accelerated scientific-technological progress in this branch of economy. The growth of intensity in agricultural production is predicated on specification, testing and prudent introduction of comprehensive programs (not merely individual recommendations) in production, all of which will facilitate the achievement of a qualitatively new, substantially more productive level of technical methods, technology and organization in plant and animal production, and thus, also fundamentally better results of the production.

Chemicalization of the processes of production which holds a foremost place in programs for intensified agricultural production contributes significantly to better food production, to changes in the technological processes of production, to better returns of production as well as to comprehensive industrialization and modernization of agriculture. In accordance with basic documentation adopted by the leadership of the CPCZ and of the government of chemicalization and for its scientifically warranted introduction in every sector of agricultural production.

Our socialist state has built up an extensive base of production for agricultural chemicalization; it augments its supplies with imports and at the same time offers economic advantages for the development of chemicalization in our economy by the system of investments compensated from state funds.

The supplies of fertilizers per hectare of agricultural lands increased in our country over the past 20 years from 70 kg of pure nutrients per hectare of agricultural lands in 1960 to 255 kg in 1980, i.e., by 265 percent, and thus, we reached the level of the most advanced countries in the world which are now experiencing stagnation and some of them even declining in the sales of fertilizers.

In the CSSR, we provide our agricultural enterprises with more than 30 types of fertilizers, most of them solid. Although the share of our domestic production in

deliveries of fertilizers to Czechoslovak agriculture is 84 percent for nitrogenous, 70 percent for phosphatic, and 33 percent for potassic fertilizers, we are importing raw materials for the production of fertilizers in amounts nearly equal to their consumption. The prices of imported fertilizers and raw materials for their production have skyrocketed and it is, therefore, absolutely necessary to apply fertilizers in our scientifically managed agrotechnology as efficiently as possible and to further increase the deliveries of fertilizers as warranted by our production and economy.

Highly efficient application of fertilizers for superior yields and high quality of all crops is contingent on agrotechnology in every enterprise and on the whole technology of production which will reduce losses of such very costly means of production to an absolute minimum. Above all, it is necessary to preserve the nutrients and ample organic matters in stable manure and to improve soil with the aid of technology in order to render it more fruitful. It is unconscionable to request higher, socially costly deliveries of fertilizers without utilizing our domestic resources of stable manure. By the same token, fertilizers must be applied so as to avoid overfertilization of certain crops and underfertilization of others in some enterprises. In addition to wasted fertilizers and higher financial outlays, this is detrimental to the desirable quality of production and compounds the losses.

The report on the main directions for economic and social development of the CSSR in 1981-1985 submitted to the 16th CPCZ Congress envisages that in the Seventh Five-Year Plan "the supplies of fertilizers will be up 8 to 10 percent." Soils will be saturated with potassium (K_2O), deliveries of nitrogenous and phosphatic fertilizers will be increased to 20 to 25 kg of pure nutrients per hectare of agricultural lands, and in 1985 the amount of delivered fertilizers will be 275 to 280 kg of pure nutrients.

The preconditions and methods for achieving the above-mentioned volume of supplies are now being specified. Due to considerable demands on energy and raw materials, it is anticipated that the Seventh Five-Year Plan the increment in fertilizer supplies will be covered exclusively by imports of nitrogenous fertilizers from the USSR and of phosphatic fertilizers from the nonsocialist states. This solution is expensive in terms of social costs and foreign exchange and therefore, it must be balanced by the production in other branches; again, this calls unequivocally for the most efficient utilization of those means of production.

Supplies of fertilizers are the highest in the Netherlands (about 310 kg of pure nutrients per hectare of agricultural lands), in Belgium (about 280 kg, although as early as 1974 they had amounted to more than 350 kg), in the GDR (280 kg) and in the FRG (approximately 260 kg). The consumption of fertilizers in other countries is considerably lower (Denmark about 220 kg of pure nutrients, France about 160, Austria 100 and Italy 80).

The standard yields of grain crops per hectare in the above-named countries are higher than in the CSSR, particularly in the Netherlands (about 4.8 tons) which has, however, more temperate climate. In Belgium, Denmark, the FRG, France and Austria grain crops yield approximately 4.0 tons, which is basically comparable with the CSSR. The yields of other crops, especially sugar beets and potatoes as well as of hay are higher and stabler in the above-mentioned countries than in the CSSR. For instance, sugar beets yield over 40.0 to 45.0 tons, potatoes over 20.0 tons (in the

FRG more than 25.0 tons and in the Netherlands over 30.0 tons) and hay of multiannual fodder crops over 10.0 to 12.0 tons. The average yield in the CSSR during the Sixth Five-Year Plan was in the range from 33.0 to 34.0 tons of sugar beets, about 16.0 to 17.0 tons of potatoes, and 7.0 to 7.5 tons of multiannual fodder crops.

Because fertilizers are vitally important for the growth of intensity in the production of agricultural crops, for their best possible utilization it is absolutely necessary to apply in the future other stimulating factors and elements of agrotechnology, especially more prolific seeds and seedlings; work in the fields and harvesting must be completed according to the agrotechnical schedule and with minimum losses. Proper storage is essential and products made from crops must be efficiently utilized. Our foremost economic enterprises--united agricultural cooperatives and state farms--are spending under similar conditions of production 10 to 10 [sic] percent more for fertilizers per hectare of grain crops than below-average enterprises, yet their yields are 25 to 40 percent higher. The outlays per hectare for sugar beets and potatoes are roughly identical in the most progressive enterprises and in the below-average enterprises (even slightly lower) and yet their yields are 25 to 30 percent higher. Thus, the advanced enterprises apply substantially less fertilizers per unit of production, due in part to the high standard of their agrotechnology throughout the process of production.

In the course of the Seventh Five-Year Plan, the volume of fertilizers must be increased and moreover, manufacturers must also improve their quality for their more effective application. In particular, they must deal with the problems of the inconvenient flow rate and granulometric consistency of ammonium nitrate and lime, with the low nutritional value of simple superphosphate, with the lumping of urea, and in general, with appropriate packaging, too. Thus, the costs of transport, storage and application may be cut, and both direct and indirect losses in the application of fertilizers may be reduced.

Because of insufficient liming of soils, the share of lands with highly acidic reaction has risen to over 34 percent of our entire acreage. At present about 2 million tons of calcareous materials are used annually for soil liming; before 1985 this amount must be increased to more than 2.9 million tons, of which about 700,000 tons must be covered by blast-furnace slag. Supplies of calcareous fertilizers must be increased to a required volume by negotiations between ministries, guarantees by the Ministry of Metallurgy and Heavy Engineering and by the Ministry of Construction of both national republics, and by exploitation of local resources. At the same time, agricultural enterprises must systematically use available local resources of calcareous materials.

In the Seventh Five-Year Plan, chemical protection of crops demands better, more extensive and more efficient application which in efficient modern mass production helps reduce and prevent losses in crop yields, replaces manual labor and facilitates mechanization and rationalization of harvesting operation and introduction of highly efficient technology in crop cultivation. The selection of means for crop protection approved and used at present includes more than 400 products amounting to approximately 14,000 tons of effective agents. More than 70 percent of the currently consumed pesticides are covered by their supplies. Domestic production covers 59 percent of their total amount, imports and cooperation with the socialist countries supply 7 percent, and 34 percent are imported from the nonsocialist states.

For the Seventh Five-Year Plan, preconditions are set for upgrading the quality of chemical agents for crop protection supplied in the total amount of about 21 percent, of which approximately 16 percent is to be from our domestic production, about 88 percent from deliveries based on our cooperation with the socialist countries, and 15 to 16 percent from imports from the nonsocialist states. Average annual deliveries of those substances will amount to Kcs 2.13 billion. Such material and financial outlays are quite substantial; they represent the amount of Kcs 310 per hectare of agricultural lands and Kcs 445 per hectare of arable lands.

It is, therefore, imperative to introduce systematic and conceptual programs which will deal in the most economical and efficient way with comprehensive crop protection within the framework of scientifically warranted and determined agrotechnology. Every principle of environmental protection must be heeded and every operation must be expertly organized not only to avoid depreciation of the production and to prevent other losses, but, on the contrary, to prevent all possible losses in quantity and quality of production. It is of utmost importance that this sector stimulate scientific research to develop new products and methods of technical application and to specify comprehensive long-range concepts for crop protection.

Special service enterprises (agrochemical enterprises) are being organized under the auspices of the OZS [district agricultural administration] as joint agricultural enterprises for the purpose of introducing chemication in the form of scientifically planned systems of nutrition and crop protection based on the concept for the development of the production base for socialist mass production. Those enterprises must markedly expand their own production base during the Seventh Five-Year Plan and at the same time, increase substantially the scope of agrochemical services for basic production enterprises. Agricultural enterprises themselves are now applying most of the fertilizers and stable manure and conducting about 50 percent of plant protection operations. About 11 to 20 percent of operations related to crop protection are performed by STS [state tractor stations]. Agricultural supply and producement enterprises are the sector in charge of chemical pesticides and lime fertilizers. These programs are being gradually transferred to agrochemical enterprises which used to render them in the past requires skill, efficiency and appropriate investment of all material funds in the form of fixed assets and currency.

The most substantive task agrochemical enterprises face in the Seventh Five-Year Plan is extensive practical application of the achievement of scientific research in the sector of crop protection and nutrition, in laboratory research of agricultural primary processing, storage, loading and unloading, manipulation, application of fertilizers and calcareous substances, comprehensive protection of agricultural crips, including storage of agrochemical agents, organization of aerial operations performed by the Slovair specialized enterprise, and organization, application and supervision of better utilization of stable manure.

During the current five-year plan period all the above-mentioned programs cannot be implemented in their full scope and meet the standards of high quality. Individual okreses, however, must provide comprehensive preconditions so that these enterprises may render increasingly more agrochemical services and upgrade the efficiency and intensity of our agricultural production so as to achieve higher stability of development and efficient application of chemicals in agricultural production while observing the principles of environmental protection.

Improvement of such programs is contingent on the completion of the organization and upgrading of the central management of crop nutrition and protection, especially on an efficient systematic management of botanical medical services and on the development of programs for agrochemical enterprises through regional agricultural administrations and district agricultural administrations. Furthermore, cooperation with the branches of the Central Control and Testing Agricultural Institute and the branches of the Institute for the Scientific Management System must be intensified on every level in order to benefit from the achievements of chemicalization and to implement division of labor in the most efficient way.

During the Seventh Five-Year Plan, chemicalization and biological agents must be introduced in animal production with due perseverance. In this period we shall obtain new resources of industrially produced fodder supplements, particularly dried fodder yeast, dicalcium phosphate, lysine, pharmaceutical products, agents controlling physiological functions of the organism, etc. Sciences and research are working diligently in this sector according to their research plan outlined in the state goal-oriented program for biochemicalization and chemicalization of animal production in the Seventh Five-Year Plan.

During this five-year plan period the available sources of dried fodder yeast amounting to about 18,000 tons will be augmented before 1985 by 10,000 tons imported from the USSR, where a large enterprise is now under construction in cooperation with the timber-processing enterprise in Paskov will be increased by 30,000 tons. In addition, the Fosfa national enterprise under construction in Postorna will supply sources of dicalcium phosphate in the amount of 40,000 tons before 1985 and in the amount of 50,000 thereafter. During this five-year plan the production of L-lysine will be gradually increased by 1,000 tons to 4,000 tons.

The key task for the Seventh Five-Year Plan, however, is to build new capacities for the manufacture of those supplements and biofactors for which we have appropriate preconditions. By the same token we must distinctly expand our cooperation with the USSR and other socialist states for an advantageous division of labor.

Part of the state goal-oriented program for biochemicalization and chemicalization of animal production involves its guaranteed investment of financial resources and material requirements. During this five-year plan the manufacture of tylosine (an antibiotic for mass-scale cattle raising) will receive priority with investments amounting to Kcs 50 million. Part of the goal-oriented program concerns gradual supplies of fermenting coccidiostatics, growth stimulators (especially Carbadox), vitamins C, B_2, D_2 and D_3, medicated fodder products and highly concentrated biofactor supplements. Of particular importance is the production of Oestrophan, which regulates the reproductive cycle in heifers and cows and gestation in sows according to the needs of the mass technological production. It is necessary to introduce chemicalization and biochemicalization in animal production and scientifically controlled animal nutrition and to maintain the required volume and quality of fodders in order to intensify animal production by the most rational methods.

The program for agricultural development in the Seventh Five-Year Plan, which is extremely demanding, requires that our food production be expanded from our own resources under the conditions of material and nonmaterial implementation of this program. The resources for the development of chemicalization and biologization of our

agricultural production, including scientific and technological development, are among the most vital means for the implementation of this program. It is, therefore, imperative to use the above-mentioned resources comprehensively and intensively in order to accomplish in this sector the objectives of the five-year plan.

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